

SOV/24-58-9-22/31

AUTHORS: Bartenev, G.M. and Lavrent'yev, V.V. (Moscow)

TITLE: The Law of Friction for Highly Elastic Materials
(O zakone treniya vysokoelasticheskikh materialov)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Otdeleniye Tekhnicheskikh Nauk, 1958, Nr 9, pp 126 - 129 (USSR)

ABSTRACT: The paper is a continuation of Bartenev's previous work (Refs 1, 6, 7). In addition to this work, the results of Harry and Prock (Ref 2), Thirion (Ref 3), Denny (Ref 4) and Schallamach (Ref 5) are reviewed, with special reference to the law connecting μ , the friction coefficient of rubber on a smooth surface (for example, polished steel), with P , the normal load, S' , the nominal area of contact and S''_0 , the actual residual area of contact as $p \rightarrow 0$, where $p = P/S'$. The relationship proposed earlier by Bartenev (Ref 6):

$$\frac{1}{\mu} = \frac{1}{C} \frac{1 + \alpha p}{\alpha + S''_0/S'p} \quad (4)$$

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where α is a constant depending on the elasticity modulus of the rubber and C is a constant depending on the experimental conditions, is shown to reduce in special

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The Law of Friction for Highly Elastic Materials

cases to the formulae used by some of the above workers. Experiments were carried out on SKN-18 rubber (Shore hardness 68) on aluminium at 23 and 65 °C and with two samples of SKN-26 rubber (Shore hardness 56 and 45, respectively) on steel at 23 °C. The values of c , α and S_0 are tabulated for the four sets of experiments;

Schallamach's formula: $\mu = BP^{-1/3}$ does not fit the experimental data. The difference between initial friction and friction with steady slip is also discussed. There are 5 figures, 1 table and 8 references, 4 of which are Soviet and 4 English.

ASSOCIATION: Institut rezinovoy promyshlennosti. Pedagogicheskiy institut im. Potemkina (Rubber Industry Institute. Pedagogical Institute im. Potemkin)

SUBMITTED: November 18, 1957

Card 2/2

81607

S/190/60/002/02/06/011
B004/B061

15.9000

AUTHORS: Bartenev, G. M., Lavrent'yev, V. V.

TITLE: The Nature of "Static" Friction in Rubber-like Polymers

PERIODICAL: Vysokomolekulyarnyye soyedineniya, 1960, Vol. 2, No. 2,
pp. 238-242

TEXT: After measurements with a pendulum tribometer, the latter author came to the conclusion that static friction exists in rubber as in solid bodies (Ref. 10). But later tests showed (Fig. 1) that this method was not accurate enough to determine static friction in highly elastic materials. The initial friction is greatly influenced by the duration of the previous contact between rubber and steel. Therefore, a contact time of exactly three minutes was maintained in the following experiments carried out with a tribometer from the Institut rezinovoy promyshlennosti (Institute of the Rubber Industry). When a tangential force is applied to the sample, it not only slides, but an elastic, reversible deformation also occurs, whose magnitude depends on the thickness of the sample


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81607

The Nature of "Static" Friction in
Rubber-like Polymers

S/190/60/002/02/06/011
B004/B061

(Fig. 3). Fig. 2 shows that the results were affected by the hardness of the dynamometer. The values are only conditional as they depend on the accuracy of measurement of the sliding and on the velocity of the tangential force applied. If, however, the rubber sample is firmly attached to the base, the elastic deformation can be determined, and this factor can be disregarded in the results (Fig. 4). Strictly speaking, the rubber undergoes no static friction, but for practical purposes the initial friction can conditionally be regarded as static friction. There are 4 figures and 11 references: 4 Soviet, 4 US, 2 British, and 1 German.

ASSOCIATION: Moskovskiy pedagogicheskiy institut im. Potemkina
(Moscow Pedagogical Institute imeni Potemkin) 

SUBMITTED: October 18, 1959

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S/020/61/141/002/010/027
B104/B138

AUTHORS: Bartenev, G. M., and Lavrent'yev, V. V.

TITLE: Elastic contact friction between surfaces

PERIODICAL: Akademiya nauk SSSR. Doklady, v. 141, no. 2, 1961, 334-337

TEXT: In the case of elastic contact between two bodies, for each value of the normal load N there is a fully defined corresponding area of effective contact S . Strictly speaking this relation is only theoretical. Nowadays it is assumed that for metals and rubber the relation $F = cS$ holds between the force of friction F and the area of effective contact S , where c is the specific frictional resistance. Fig. 1 represents the specific friction between HK (NK) rubber and brass as a function of the normal pressure applied. By applying higher pressures it can be seen that $c = f$ is no longer dependent on pressure. This is important for friction calculations for rubber under high loads. In the steady state the specific load required to reach this limiting value is smaller than at the beginning of the shear, due to the fact that the actual area of contact increases in the sliding process. If the loads exceed 250 kg/cm^2 a

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Elastic contact friction between surfaces

S/020/61/141/002/010/027
B104/B138

constant specific friction is reached, provided the friction is steady. In this case the contact surface S_n will also be constant. $\varphi = S/S_n$ is introduced as the relative contact surface and it is suggested that when the normal pressure is raised the rate of increase in φ diminishes as the proportion of the surface outside the contact diminishes $(1 - \varphi)$, as the modulus of elasticity E of the rubber increases in uniaxial compression. These propositions are described by the differential equation

$$d\varphi = \beta(1 - \varphi) \frac{dp}{E}.$$

The solution obtained from this equation is

$$F = cS_n - c(S - S_0) \exp(-\beta/E) \cdot p, \text{ where } S_0 \text{ is the contact surface for } p \rightarrow 0.$$

In a graph representing $\log(cS_n - F)$ as a function of p , in accordance with the above solution, the measured values shown in Fig. 2 plot almost exactly in a straight line. $A\beta = 0.17$ is obtained from the gradient of the straight line. There are 3 figures and 11 references: 9 Soviet and 2 non-Soviet. The two references to English-language publications read as follows: P. Thirion, Rubb. Chem. Techn., 21, 505 (1948); J. Hurry, J. Prock, India Rubber World, 128, 619 (1953).

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Elastic contact friction between surfaces

5/020/61/141/002/010/027
B104/B138

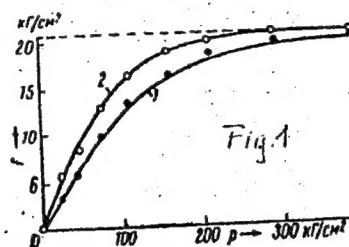
ASSOCIATION: Moskovskiy gosudarstvennyy pedagogicheskiy institut im.
V. I. Lenina (Moscow State Pedagogical Institute imeni
V. I. Lenin)

PRESENTED: July 1, 1961, by P. A. Rebinder, Academician

SUBMITTED: June 27, 1961

Fig. 1. Specific force of friction, $f = c$, as a function of the pressure applied to NK rubber in contact with brass.

Legend: (1) Initial friction;
(2) steady friction.



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LAVRENT'YEV, V.V.

Tribometer for measuring the friction power of low-modulus high-molecular weight polymers. Kauch. i rez. 20 no.9:33 S '61.
(MIRA 15:2)

1. Moskovskiy Gosudarstvennyy pedagogicheskiy institut im. V.I. Lenina.

(Macromolecular compounds)
(Tribometers)

5.3830

39846
S/190/62/004/008/004/016
B101/B180

AUTHOR: Lavrent'yev, V. V.

TITLE: Investigation of the true contact area of polymers

PERIODICAL: Vysokomolekulyarnyye soyedineniya, v. 4, no. 8, 1962, 1151-1154

TEXT: Mechau's optical method was employed to measure the true contact area between polymers (rubber or polyethylene) and smooth surfaces at

0 - 100°C and pressures up to 20 kg/cm². The method is based on the interruption of the total internal reflection of a light ray passing through a prism the lower face of which is in contact with the polymer specimen. Results: (1) The true contact area increases with temperature and contact time. (2) Equations derived earlier (Dokl. AN SSSR, 141, 334, 1961) for the exponential increase in contact area with rising normal pressure, were confirmed by the experiments. (3) At low sliding rates (up to 0.1 cm/sec) the true contact area is the same as when at rest. (4) At constant pressure the true contact area depends on the geometry of the specimen. There are 4 figures. The English-language reference is: F. Bowden, D. Tabor, Friction and Lubrication of Solids, Oxford, 1950.

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Investigation of the true contact ...

S/190/62/004/008/004/016
B101/B180

ASSOCIATION: Moskovskiy gosudarstvennyy pedagogicheskiy institut im.
V. I. Lenina (Moscow State Pedagogical Institute imeni
V. I. Lenin)

SUBMITTED: May 4, 1961

Card 2/2

DYURICH, N.A., YEL'KIN, A.YE., LAVRENT'YEV, V.V.

New apparatus and methods for determining the friction coefficient of polymers.

Report presented at the 13th Conference on high-molecular compounds.
Moscow, 8-11 Oct 62

S/138/63/000/003/006/008
A051/A126

AUTHORS: Bartenev, G. M., Lavrent'yev, V. V., Yel'kin, A. I.

TITLE: The friction coefficient of rubber

PERIODICAL: Kauchuk i rezina, no. 3, 1963, 20 - 22

TEXT: The friction coefficient of rubber is defined as the main characteristic in calculating the friction properties of parts and machine units; in engineering practice it is the ratio of friction force F to the normal load N : $\mu = \frac{F}{N}$. The magnitude of the nominal surface of contact parts is not taken into account. The effect of the nominal contact surface on the friction coefficient of rubber is studied, measured at $N = \text{const}$, and $p = \text{const}$ (nominal pressure - $p = N/S_n$). Conclusion: the friction coefficient measured at $N = \text{const}$ depends on the nominal contact surface; measured at $p = \text{const}$ it does not depend on it. Experiments have confirmed this conclusion. The friction coefficient was measured on a tribometer instrument (Figure 1) based on the idea that the contact surface changes simultaneously with a change of the load, whereby the pressure

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The friction coefficient of rubber

S/138/63/000/003/006/008
A051/A126

remains constant. For materials of various hardness, a different change in the friction coefficient is noted depending on the nominal contact surface. It is generally concluded that, when using the friction coefficient for calculating parts and evaluating their friction properties, it is necessary to consider that the friction coefficient determined according to ГОСТ-426-57 (GOST-426-57) is only a relative value, since it depends on the magnitude of nominal contact surface and nominal load. At a constant normal pressure, the friction coefficient is actually a constant value for various nominal contact surfaces and can be used in calculating constructions only for normal pressures where it has been measured. In other normal pressures, it can be calculated from the law of rubber friction. There are 2 figures and 1 table.

ASSOCIATION: Problemnaya laboratoriya fiziki polimerov pri MGPI im. V. I. Lenina
(Laboratory for Problems of Polymer Physics at the MGPI im. V. I. Lenin)

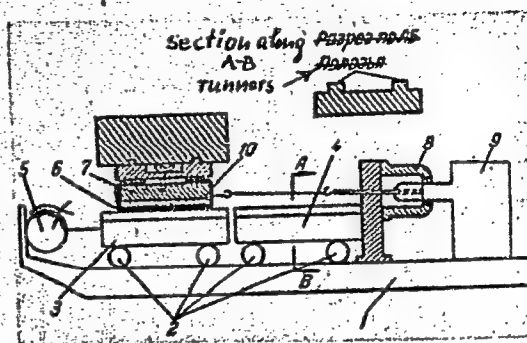
Card 2/3

The friction coefficient of rubber

S/138/63/000/003/006/008
A051/A126

Figure 1. Diagram of the tribometer for the study of the effect of nominal contact surface on the friction coefficient of rubber under a constant pressure

Legend: 1 - steel base, 2 - rollers, 3, 4 - carriages, 5 - dynamometer, 6 - tested sample, 7 - holder, 8 - micro-metric screw, 9 - reducer, 10 - porous rubber.



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L 3561-66 ENT(m)/ENP(w)/EPF(f)/EWP(j)/T/EWP(t)/EWP(b) JD/EM/DJ/GS/RM

ACCESSION NR: AT5022666

UR/0000/65/000/000/0017/0021

AUTHOR: Lavrent'yev, V. V.

TITLE: Effects of initial stress on the coefficient of surface friction of polymers

SOURCE: AN SSSR. Nauchnyy sovet po treniyu i smazkam. Teoriya treniya i iznosa (Theory of friction and wear). Moscow, Izd-vo Nauka, 1965, 17-21

TOPIC TAGS: friction coefficient, polymer friction, friction force, elastic polymer

ABSTRACT: The coefficient of surface friction of stressed polymer materials was investigated. Based on the equation

$$V = \frac{\lambda}{f} \left(\frac{k v_{a60}}{2\pi T} \right)^{1/2} \exp \left(\frac{qT}{k v_{a60}} \right)$$

which relates the sliding velocity and the friction force (G. M. Bartenev, O: zakone treniya vysokoelastichnykh materialov po tverdyim gladkim poverkhnostyam. Dokl. AN SSSR, 1957, No. 4) and

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$$t = t_0 e^{\frac{qT}{k v_{a60}}}$$

L 3561-66

ACCESSION NR: AT5022666

for a stressed material (B. A. Dogadkin, G. M. Bartenev, and M. M. Reznikovskiy. Issledovaniye v oblasti vysokomolekulyarnykh soyedineniy. Trudy NIIRP, Goskhimzdat, M.-L., 1949) the equation for the friction force is found to be linear with stress:

$$T = C - b\sigma$$

$$C = \frac{kT_{abs}}{1} \ln \frac{V_{10}}{B} + \frac{u}{1}; \quad b = \frac{c}{1}$$

(where u = friction process activation energy; T_{abs} = absolute temperature; k = Boltzman constant). Thin sheets (150 x 50 mm) of a highly elastic polymer 1 were placed on movable table 2 (see Fig. 1 on the Enclosure), and a metal slider (or sphere) 3 loaded with 4 moved at a prescribed velocity on the specimen stressed by load P . The friction force was recorded with a strain gage ring 5. It was found that: a) the specific friction force decreased linearly with stress (0-100 kg/cm²), was larger along the stress direction than across, the difference between the friction forces in orthogonal directions increased with increasing normal load (0.2-0.8 kg), and the above derived equation was well satisfied except for very small stresses; b) the coefficient of friction for smooth surfaces changed considerably when the normal load was changed (0.2-0.8 kg/cm²) but remained almost

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L 3561-66

ACCESSION NR: AT5022666

independent of stress for spherical specimens (representing rough surfaces).
The results indicate that polymer friction is primarily of the adhesion type.
Orig. art. has: 5 figures and 4 formulas.

ASSOCIATION: Nauchnyy sovet po treniyu i smazkam, AN SSSR (Scientific Committee
on Friction and Lubrication, AN SSSR)

SUBMITTED: 18 May 65

ENCL: 01

SUB CODE: MA

NO REF SOV: 002

OTHER: 002

Card 3/4

L 3561-66
ACCESSION NR: AT5022666

ENCLOSURE: 01
0

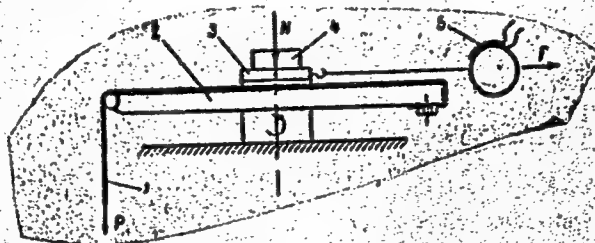


Fig. 1.
Experimental apparatus (notation in text)

mlr
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L 3789-66 ENT(m)/EPF(c)/EWP(j)/T DJ/RM

ACCESSION NR: AP5023213 UR/0374/65/000/004/0123/0129
678.531.44

AUTHOR: Bartenev, G. M. (Moscow); Lavrent'yev, V. V. (Moscow); Konstantinova, N. A. (Moscow)

TITLE: Effect of normal load on temperature and slip rate dependence of frictional force of highly elastic materials

SOURCE: Mekhanika polimerov, no. 4, 1965, 123-129

TOPIC TAGS: synthetic rubber, friction, internal friction, friction coefficient, copolymer, synthetic material, vulcanization

ABSTRACT: The effect of normal load on temperature and slip rate dependence of frictional force of cross-linked butadiene-acrylonitrile copolymers (rubbers based on SKN-18, SKN-25, and SKN-40) on polished steel was investigated. The object of this study was to amplify the knowledge on performance of these highly elastic rubbers, specifically, to extend it to high normal loads. This study was, also, expected to yield more understanding of the molecular-kinetic nature of the internal friction in polymers. In the 18-100°C range, the frictional force of vulcanized rubbers is inversely proportional to temperature. Up to 10^7 n/m², the effect of

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L 3789-66

ACCESSION NR: AP5023213

load on the temperature dependence of friction reflects only the change of the actual contact area or the increase in the tangent of the angle of inclination of temperature dependence of friction with increasing load. There is a similar relationship between the friction force of all three rubbers and the logarithm of slip rate. The dependence of friction force upon the logarithm of the slip rate for SKN-18 based rubber shows a slight dependence of both the activation energy and the average jump distance of a molecular chain upon the specific load. In the low slip friction range, the friction force is linearly dependent upon the logarithm of slip rate. At speeds above 44 cm/min and a load of $30 \cdot 10^5 \text{ n/m}^2$, the friction force rises sharply due to uncontrollable heating of the friction surface. Orig. art. has: 5 figures, 1 table, 7 formulas.

ASSOCIATION: none

SUBMITTED: 18Mar65

ENCL: 00

SUB CODE: MT

NO REF SOV: 008

OTHER: 013

PC

Card 2/2

L 39607-66 ENT(m)/EnP()/T/ETC(m)-6 RM/HG/GD-2

ACC NR: AP6003948

SOURCE CODE: UR/0374/65/000/005/0128/0134.

AUTHOR: Shlenskiy, O. F. (Moskva); Khovanskaya, N. N. (Moskva); Lavrent'yev, V. V. (Moskva)

ORG: none

TITLE: Method for comprehensive study of the mechanical properties of polymer films

SOURCE: Mekhanika polimerov, no. 5, 1965, 128-134

TOPIC TAGS: polymer, polyethylene plastic, photographic film, anisotropic medium, time, temperature dependence, poisson effect

ABSTRACT: Testers for determining the coefficients of lateral contraction of anisotropic film materials depending on the time and temperature are described. The test results of the polyethelene films are reported. Orig. art. has: 9 figures, 4 formulas, and 1 table. [Based on author's abstract]

SUB CODE: 11 SUBM DATE: 11Jan65/ ORIG REF: 002/ OTH REF: 002/ ATD PRESS:

Card 1/1/12/15

UDC: 678:620.17

2

L 41187-66 EWT(m)/T/EWP(v)/EWP(j) IJP(c) WW/RM/JWD

ACC NR: AP6023431

SOURCE CODE: UR/0190/66/008/007/1247/1251

AUTHOR: Korenevskaya, N. S.; Lavrent'yev, V. V.; Yagnyatinskaya, S. M.; Rayevskiy, V. G.; Voyutskiy, S. S.

ORG: 2nd Moscow State Medical Institute (2-y Moskovskiy gosudarstvennyy^{meditsinskiy} institut);
Moscow Institute of Fine Chemical Technology im. M. V. Lomonosov (Moskovskiy institut
tonkoy khimicheskoy tekhnologii)

TITLE: Effect of degree of contact on the strength of adhesive bonds between an elastomer and a solid substrate

SOURCE: Vysokomolekulyarnyye soyedineniya, v. 8, no. 7, 1966, 1247-1251

TOPIC TAGS: elastomer, adhesive bonding

ABSTRACT: An optical method was used to study the effect of the conditions/under which elastomer - solid substrate and elastomer - elastomer adhesive bonds² are formed on the strength of the bonds and the degree of the contact between adhesive and substrate. The adhesive¹ employed was SKN-40² butadiene-acrylonitrile copolymer, and the substrate was a polished part of a paste prepared from a mixture of channel-black powder and polyvinyl alcohol binder.³ The optical instrument used for determining the area of actual contact is described. The effect of pressure and duration of the contact on the extent of the adhesive - substrate contact was determined. It is shown that in both types of adhesive bonds studied, the increase of adhesive strength with

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UDC: 678.01.53

ACC NR: AP6023431

the observation time continues even after the equilibrium value of the degree of contact has been established. It is postulated that the discrepancies observed between the course of the kinetic relationships and the strength of the self-adhesive elastomer - elastomer bond is due to volume diffusion processes, and in the case of the adhesive elastomer - solid substrate bond, to microrheological processes and surface diffusion. Authors thank V. F. Mal'tsev for carrying out a part of the work at the colloid chemistry department of MITKhT im. M. V. Lomonosov. Orig. art. has: 5 figures.

SUB CODE: 11/ SUBM DATE: 23Jun65/ ORIG REF: 007/ OTH REF: 001

Card 2/2

ACC NR: AP6036353

SOURCE CODE: UR/0138/66/000/011/0022/0025

AUTHOR: Lavrent'yev, V. V.; Shlenskiy, O. F.

ORG: Department of Experimental and Theoretical Physics, Second Moscow State Medical Institute im. N. I. Pirogov (Kafedra eksperimental'noy i teoreticheskoy fiziki, 2-y Moskovskiy Gosudarstvennyy meditsinskiy institut)

TITLE: Method of determining the mechanical characteristics of highly elastic materials under complex stress

SOURCE: Kauchuk i rezina, no. 11, 1966, 22-25

TOPIC TAGS: elastic deformation, complex stress, shell deformation

ABSTRACT: A method has been developed for calculating stresses and relative strains in a specimen in a two-dimensional stressed state. The necessary relationships are derived by considering a shell into which is converted a specimen exposed to the action of air pressure. The behavior of the surface of a shell of SKS-30 rubber film 1 mm thick was photographed. Formulas are derived for the maximum tension in the specimen. The whole process of deformation of the specimen is divided into two periods; a correlation exists between the uniaxial and biaxial stressed states in the first and second periods of tension. Therefore, using the derived relationships for the biaxial stressed state, one can determine the characteristics of the specimen under uniaxial deformation. Results of the study made it possible to construct an

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UDC: 678.4:620.172.2

ACC NR: AP6036353

instrument for testing specimens under complex stress. Orig. art. has: 4 figures,
1 table and 16 formulas.

SUB CODE: 20/ SUBM DATE: 16Mar65/ ORIG REF: 003/ OTH REF: 001

Card 2/2

DOROGOCHINSKIY, A.Z.; NAKHAPETIAN, L.A.; LAVRENT'YEV, V.Y.; BOYKOVA, Ye.P.;
KOST, A.N.; YERSHOV, V.V.

Antioxidant properties of some derivatives of pyrazoline. Izv.
vys.ucheb.zav.; neft'i gaz 3 no.3:69-71 '60. (MIRA 14:10)

1. Moskovskiy gosudarstvennyy universitet imeni M.V.Lomonosova i
Groznskiy nauchno-issledovatel'skiy neftyanoy institut.
(Pyrazoline)

S/119/62/000/008/004/004
D262/D308

AUTHOR: Lavrent'yev, Ye.A., Engineer

TITLE: Machines for fatigue testing of metals at high temperatures

PERIODICAL: Priborostroyeniye, no. 8, 1962, 29 - 30

TEXT: The article describes two testing machines: YKMT-3000 (UKIT-3000) and YKT-3000 (UKT-3000), working on the following bases:
a) Constant moment created by the load, acting on a rotating specimen, and b) constant moment created by the rotating field of forces, acting on a stationary specimen. The machines permit testing cylindrical specimens at alternating symmetrical loading cycle, with stress changes forming a sinusoidal curve, at a temperature range of 800 - 1100°C and frequency of test load from 1000 to 6000 rpm. The technical details of the machines are described, their basic working characteristics tabulated and methods of operation explained. There are 1 table and 2 figures. ✓

Card 1/1

USHAKOV, S.N.; LAVRENI'YEV, Ye.M.; PODGORSKAYA, K.S.; PETROVA, L.I.

Synthesis of vinylpyrrolidinone and vinyl alcohol copolymers. Vysokom.
soed. 6 no.8:1440-1441 Ag '64. (MIRA 17:10)

1. Institut vysokomolekulyarnykh soyedineniy AN SSSR.

LAURENT'YEV, Ye. M.

USSR/Chemistry of High Molecular Substances.

F

Abs Jour: Ref Zhur - Khimiya, No. 8, 1957, 27090 D.

Author : Lavrent'yev, Ye. M.

Inst : Institute of High Molecular Compounds of Academy
of Sciences of USSR.

Title : Study of Reactions in Chains of Polyvinyl
Alcohol.

Orig Pub: Avtoref. diss. kand. tekhn. n., In-t vysekemole-
kul. soedineniy AN SSSR, L., 1956.

Abstract: No abstract.

Card 1/1

S/007/61/000/011/003/003
B107/B147

AUTHORS: Zhirov, K. K., Bandurkin, G. A., Lavrent'yev, Yu. G.

TITLE: Geochemistry of rare-earth elements in pegmatites of
Severnaya Kareliya

PERIODICAL: Geokhimiya, no. 11, 1961, 995 - 1004

TEXT: This paper presents data on the composition of rare earths in 41 samples of orthite, monazite, xenotime, uraninite, gummite, cyrtolite, and garnet; furthermore, it deals with the influence of paragenesis and alteration of a mineral on the composition of rare earths. The samples were taken from pegmatites of the Belomorskiy archaic metamorphic complex, Severnaya Kareliya. According to K. A. Shurkin (Ref. 9: Tr. Lab. geologii dokembriya, Izd-vo AN SSSR, no. 9, 1960), this complex consists of the following formations: 1) lower formation: leucocratic biotite gneisses and granite gneisses, strongly metamorphized; 2) intermediate formation: amphibole, amphibole-biotite, and biotite gneisses, amphibolites; 3) upper formation: Disthene-garnet-biotite and garnet-biotite gneisses. The following previous publications on the composition of rare earths in

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Geochemistry of rare-earth elements ...

S/007/61/000/011/003/003
B107/B147

minerals of Kareliya are referred to: S. A. Borovik (Ref. 10: Dokl. AN SSSR, Ser. nov. 14, 351, 1937); V. N. Protopopov (Ref. 11: Materialy TsNIGRI, Geokhimiya. sb. 5, 30, 1940); E. Ye. Vaynshteyn, A. I. Tugarinov, N. V. Turanskaya (Ref. 12: Geokhimiya 2, 36, 1956); Ye. I. Semenov, R. L. Barinskiy (Ref. 13: Geokhimiya, No. 4, 1958); V. A. Leonova (Ref. 14: Zap. Vses. mineralog. ob-va 88, No. 1, 1959); and D. A. Mineyev (Ref. 15: Geokhimiya, No. 2, 1960). I. B. Ivanov, Ye. V. Kostetskaya, and Ye. V. Bibikova took part in collecting samples for this study. The analysis of rare earths was carried out at the radiochemical laboratory of the Institut mineralogii, geokhimii i kristallokhimii redkikh elementov (Institute of Mineralogy, Geochemistry, and Crystallochemistry of Rare Elements) by the method of R. L. Barinskiy (Ref. 16: Zavodsk. laboratoriya 24, 613, 1958). The sensitivity for the individual elements is 0.1 %; the accuracy for monazite, xenotime, orthite is 7 - 10 %, and for uraninite and gummite, 20 %. The values for odd-numbered elements are semiquantitative in the latter. Determination was carried out without previous enrichment. Some yttrium determinations were carried out at the radiochemical laboratory of the Institut geologii rudnykh mestorozhdeniy, petrografii, mineralogii i geokhimii (Institute of Geology of Mineral Deposits. ✓
Card 2/7₄

Geochemistry of rare-earth elements ...

S/007/61/000/011/003/003
B107/B147

Petrography and Geochemistry): focusing spectrometer of the type PCK -4 (RSK-4), sensitivity 0.05%, accuracy 10%. The authors thank R. L. Barinskiy and K. I. Narbutt for the permission to work in their laboratories and for help. Result (see Table 2): The composition of rare earths in monazite and xenotime is virtually independent of paragenesis. It varies, however, considerably in orthite and uraninite. Rare earths are precipitated in the following sequence: apatite, orthite, monazite, (xenotime+cyrtolite+uraninite), carburan. In pegmatites with this sequence, first yttrium oxides are fixed in apatite (Ye. V. Kostetskaya, Ref. 23: *Raspredeleniye redkikh zemel' v apatitakh nekotorykh pegmatitovykh zhil Sev. Karelii*. (Distribution of rare earths in the apatites of some pegmatite veins in Severnaya Kareliya). Kafedra geokhimii Moskovskogo gosudarstvennogo universiteta im. M. V. Lomonosova (Department of Geochemistry of Moscow State University imeni M. V. Lomonosov), 1958); then, the cerium earths are precipitated in orthite and monazite, and, finally, yttrium oxides in xenotime and in the other minerals mentioned. Uraninites have a Gd - Dy - Er maximum. In pegmatites without apatite, orthites are enriched with yttrium oxides. Uraninites have a Dy - Er - Yb maximum. Accordingly, the composition depends on the presence of phos-

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Geochemistry of rare-earth elements ...

S/007/61/000/011/003/003
B107/B147

phate ions. In this connection it is assumed that rare earths are transported as pyrophosphate complex. The authors thank V. D. Nikitin, P. P. Borovikov, and Yu. V. Nikitin for help in field work and material selection. There are 3 figures, 2 tables, and 32 references: 27 Soviet and 5 non-Soviet. The three most recent references to English-language publications read as follows: E. W. Heinrich, R. A. Borup, A. A. Levinson. *Geochim. et Cosmochim. Acta*, 19, No. 3, 1960; M. K. Carron, C. R. Naeser, H. J. Rose, F. A. Hildebrand. *U. S. Geol. Sur. Bull.*, No. 1036 - N, 1958; C. Frondel. *Am. Miner.* 41, 7 - 8, 539, 1956.

ASSOCIATION: Kafedra geokhimii Moskovskogo gosudarstvennogo universiteta im. M. V. Lomonosova (Department of Geochemistry of Moscow State University imeni M. V. Lomonosov). Institut geokhimii Sibirskogo otdeleniya AN SSSR (Institute of Geochemistry of the Siberian Department of the AS USSR)

SUBMITTED: April 1, 1961

Card 4/7
4

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ACCESSION NO: AP4013298

S/0032/64/030/002/0168/0169

AUTHOR: Lavrent'yev, Yu. G.

TITLE: X ray spectrometric determination of small amounts of titanium in niobium pentoxide

SOURCE: Zavodskaya laboratoriya, v. 30, no. 2, 1964, 168-169

TOPIC TAGS: titanium, niobium, x ray spectrometric determination, titanium dioxide, niobium pentoxide, x ray analysis, absorption line intensity, light filter

ABSTRACT: The determinations were conducted on a DRUS-2 x-ray spectrometer with a quartz crystal. Niobium pentoxide samples were packed on a hydraulic press into a cuvette 20 mm in diameter and 1-2 mm deep, yielding a solid smooth surface. The K alpha, line of titanium, at lambda 5485.74X, was chosen as a lead. To eliminate interference on the part of line NbL beta, at lambda 5481.0X, a cellophane filter between 20 and 40 microns thick was used to lower its intensity. The standards were prepared by mixing the desired quantities of niobium pentoxide and titanium dioxide, followed by dissolving in hydrofluoric acid and precipitation with ammonia to prevent the particle size from affecting the intensity of the analytical line. The author concedes that it is quite difficult to achieve a complete precipitation

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ACCESSION NO: AP4013298

of the dissolved mixture. The method was checked against the chemical and spectral techniques, and satisfactory matching results were obtained. The minimum detectable concentration of titanium was 0.01%, and it is possible to run 10-15 determinations in the course of a 5-hour working day, with a reproducibility within a 6-7% range, as against 8% for the chemical method and 15-20% for the spectral analysis. Orig. art. has: 1 table and 1 chart.

ASSOCIATION: none

SUBMITTED: 00

DATE ACQ: 26Feb64

ENCL: 00

SUB CODE: CH

NO REF SOV: 002

OTHER: 001

Card

2/2

LAVRENT'YEV, Yu.G.; VAYNSHTEYN, E.Ye.

Effect of the instrumental error on the precision and sensitivity
of X-ray spectral analysis. Report 1. Zhur. anal. khim. 20
no.9:918-926 '65. (MIRA 18:9)

1. Institut geokhimii i analiticheskoy khimii imeni V.I.
Vernadskogo AN SSSR, Moskva.

LAVRENT'YEV, Yu.G.; VAYNSHTEYN, E.Ye.

Effect of an instrumental error on the precision and sensitivity
of X-ray spectral analysis. Report No.2. Zhur. anal. khim. 20
no.10:1033-1037 '65. (MIRA 18:11)

1. Institut geokhimii i analiticheskoy khimii imeni V.I. Vernadskogo
AN SSSR, Moskva.

L 2273-66 EWT(m)/EPA(w)-2/SHA(m)-2 IJP(c) GS
 ACCESSION NR: AT5007942 34 52 19.05
 UR /0000/64/000/000/0500/0503
 AUTHOR: Alekseyev, A. G.; Basargin, Yu. G.; Zhukov, I. F.; Lavrent'yev, Yu. K.; Litunovskiy, R. N.; Malyshev, I. F.; Nevrov, N. P.; Stepanov, A. V.; Tuzov, I. V.
 TITLE: Basic characteristics of the isochronous cyclotron with variable particle energy
 SOURCE: International Conference on High Energy Accelerators, Dubna, 1963. Trudy. Moscow, Atomizdat, 1964, 600-603
 TOPIC TAGS: high energy accelerator, ion beam, cyclotron
 ABSTRACT: At the Scientific Research Institute of Electrophysical Equipment in D. V. Yefremov, a 2.4-meter cyclotron is being developed with a magnetic field having 3-dimensional variation. This cyclotron is intended to accelerate particles with Z/A equal to 0.125-1 in a wide range of energies. The limits of energy variation, in Mev, are: 7.5-100 (protons); 5-60 (deuterons), 10-120 (alpha-particles), and 10-145 (nitrogen ions). The device is designed to obtain relatively large ion currents, which will make it possible to realize experiments with beams against internal and remote targets. The principal parameters of the cyclotron include: pole diameter, 2400 mm; magnetic structure, tri-sector and weakly spiral; gaps, 230 mm (hill) and 960 mm (valley); magnetic field in center, 4000-17,000 oersteds;
 Card 1/3

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ACCESSION NR: AT5007942

total electromagnetic power, 2800 kilowatts; electromagnet's weight, 720 tons; frequencies of resonance system, 5-22 megahertz; accelerating voltage in Dee, 125 kilovolts; Dee gap, 50 mm; high-frequency load, 600 kilowatts; stability, 10^{-4} (winding currents), 10^{-5} (frequency of accelerating voltage), and 10^{-3} (its amplitude). After deflection the beam is directed into a commutating magnet by which the beam can be directed against targets set up in three experimental rooms: (I) high-intensity beams, (II) neutron time-of-flight experiments, and (III) nuclear precision spectroscopy with electromagnetic monochromator. Ion-optical channeling, focusing and commutating of the beam are done by six pairs of quadrupolar lenses, two identical rotary electromagnets, a monochromator electromagnet, and two small electromagnets for correction of the beam in the vertical direction. The resonance system is a quarter-wave coaxial line ending with the 180-degree Dee. The resonant frequency is reset by remote displacement of a plate without disrupting the vacuum. The frequency is established with an accuracy of 5-18 kc plus or minus. Smooth high-frequency regulation is provided by two trimmers, permitting regulation of frequency to 2-4%. The high-frequency oscillator has a capacitative connection with the resonance system. A connecting rod is used, without disruption of the vacuum, to shift the Dee in the vertical and horizontal planes, and also along its own axis. The accelerator chamber consists of two sections: a high-vacuum chamber able to exhaust, along with the resonant line, the magnetic gap; and a fore-vacuum section

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ACCESSION NR: AT5007942

installed in the electromagnet poles. Remotely controlled measuring probes and targets for operating with the internal beam are installed in the chamber. Placement of the ion source is also done remotely; moreover, it is possible, without disruption of the vacuum, to shift the cathode and also the source as a whole. The magnetic field was modelled with an electromagnet having a pole diameter of 342 mm, on which several alternative magnetic systems were investigated; and also with an electromagnet having a pole diameter of 685 mm, which was used to investigate in detail modifications in the weakly-spiral structure. On the basis of the electromagnet with poles 685 mm in diameter, a start has been made at the present time on a cyclotron with three-dimensional variation of the magnetic field, with the magnetic system of a type described in the present report. The current cyclotron will accelerate protons up to 8 Mev and deuterons up to 4 Mev, which will permit investigations into various alternative systems for yielding beams. Orig. art. has: 6 figures. 25

ASSOCIATION: Nauchno-issledovatel'skiy institut elektrofizicheskoy apparatury imeni D. V. Yefremova GKAE SSSR (Scientific Research Institute of Electrophysical Equipment, GKAE SSSR)

SUBMITTED: 20 May 64

NO REF SOV: 000

ENCL: 00

OTHER: 001

SUB CODE: EL, NP

Cord 3/3. *PP*

2828 Lavrent'Yev, Yu. L.

Vodnyi i soleyoi rezhim pochv obyvalovannykh uchastkov zapadoi bugrietoj
chasti del'ty reki Volgi M., 1954 19 s. 21 sm. (Mosk. ordena lenina gos.
un-t im. M. B. Lomonosove). 100 Ekz. B. Ts. -- (54-5486?)

VLADYCHENSKIY, S.A.; Prinimali uchastiye: Korenevskaya, V. Ye.; YAKOVLEVA, L.V.;
LAVRENT'YEV, Yu. L.; RODIONOVA, V.I.; KACHINSKIY, N.A., prof.

Moisture conditions of soils in the Volga-Akhtuba Flood Plain
and Delta. Vest.Mosk. un. Ser.6: Biol., pochv. 16 no.3:73-80
My-Je '61. (MIRA 14:6)

1. Kafedra fiziki i melioratsii pochv Moskovskogo gosudarstvennogo
universiteta.

(Volga-Akhtuba Flood Plain--Soil moisture)
(Volga Delta--Soil moisture)

LAVRENT'YEV, Yu.N.

On a continuous rail track. Put' 1 put. khoz. 8 no.7:38 '64.
(MIRA 17:10)

KOMOV, V.M.; LAVRENT'YEV, Yu.N.

Chutes are obstructed. Put' i put. khoz. 9 no.3:41 '65.
(MIRA 18:6)

KOMOV, V.M.; LAVRENT'YEV, Yu.N.

Crack in the rail. Put' i put.khoz. 9 no.6:42 '65.

(MIRA 18:6)

LAVRENT'YEV, Yu.N.

They missed the right time. Put' i put. khoz. 9 no.11:44-45
'65. (MIRA 18:11)

KOMOV, V.M.; LAVRENT'YEV, Yu.N.

There is no place in transportation for such people.
Put' 1 put.khoz. 10 no.1:43-44 '66.

(MIRA 19:1)

LAVRENT'YEVA, A. G.

"Certain Problems of Positive Copying." Thesis for degree of Cand.
Technical Sci. Sub. 15 Apr. 49, Moscow Inst. of Engineers of Geodesy, Aerial
Photography, and Cartography.

Summary 82, 18 Dec. 52, Dissertations Presented for Degrees in Science and
Engineering in Moscow in 1949. From Vechernyaya Moskva, Jan-Dec.1949

LAVRENT'YEVA, A.G.

LAVRENT'YEVA, A.G., kand.tekhn.nauk

On increasing the strength of machine forms in offset printing.
Sbor.st.po kart. no.8:61-70 '55. (MIRA 10:12)
(Offset printing) (Map printing)

KOLOSOV, Aleksandr Ivanovich; LAVRENT'YEVA, Anna Georgiyevna;
SINYAKOV, N.I., red.; STRELKOVA, A.N., red.;
PANKRATOVA, M.A., tekhn. red.

[Technology of printing in two books] Tekhnologiya poligraficheskogo proizvodstva v dvukh knigakh. Moskva, Iskustvo. Vol.1. [Preparation of printed forms] Izgotovlenie pechatnykh form. 1963. 487 p. (MIRA 17:2)

^Y
~~LAVRENT'Y~~ EVA, A.I. (Kiev)

"The Role of Microelements in the Fight Against Sterility in Agricultural Animals."

Report given at 13th Inter-VUZ (Higher Educational Insts.) Scientific-Industrial Conference, held February, 1956 at Kiev Vet Inst.

LAVRENT'EVA, A. M.

Brandy

Determination of furfural in cognac alcohol. Vin. SSSR 12 No. 2, 1952.

Monthly List of Russian Accessions, Library of Congress, June 1952. UNCLASSIFIED.

LAVERENT'YEVA, A.M., assistant.

Pupillary reaction in glaucoma [with summary in English]. Vest. oft.
71 no. 5:18-27 S-O '58 (MIRA 11:10)

1. Kafedra glaznykh bolezney (zav. - prof. N.A. Platneva) II Moskov-
skogo meditsinskogo instituta imeni N.I. Pirogova.

(GLAUCOMA, physiol.

pupillary reaction (Rus))

(PUPIL, in various dis.

glaucoma (Rus))

LAVRENT'YEVA, A.M.; MAYEVSKAYA, T.M.

Etiological treatment of herpetic keratitis. Vest. oft. 76
no.3:29-32 My-Je '63. (MIRA 17:2)

1. Kafedra glaznykh bolezney (zav. - prof. N.A. Pletneva)
II Moskovskogo meditsinskogo instituta imeni N.I. Pirogova
i Institut virusologii imeni D.I. Ivanovskogo (dir. -
deystvitel'nyy chlen AMN SSSR prof. V.M. Zhdanov) AMN
SSSR.

LAVRENT'YEVA, A. M., Candidate Med Sci (diss) -- "Visual reactions in glaucoma". Moscow, 1959. 18 pp (Second Moscow Med Inst im N. I. Pirogov), 250 copies (KL, No 25, 1959, 141)

MAYEVSKAYA, T.M.; LAVRENT'YEVA, A.M.

Isolation of herpes virus from patients with herpetic keratitis. Vop.
virus. 9 no.2:216-219 Mr-Apr '64. (MIRA 17:12)

1. Institut virusologii imeni Ivanovskogo AMN SSSR, Moskva i klinika
glaznykh bolezney II Moskovskogo meditsinskogo instituta imeni Pirogova.

LAVRENT'Y^YEV^YA, A. P.

24275

LAVRENT'YEV^YA, A. P. K anatomii limfaticheskikh sosudov susudov cukhozhilyy nizhney konechnosti cheloveka. Trudy Leningr. San.-gigien. Med. Inst^YA, T. III, 1949, S. 141-48. - Bibliogr: 13 Nazv.

SO: Letopis, No. 32, 1949.

MATVEYEV, A.A.; KOTLYAROVA, C.S.; LAVRENT'YEVA, A.V.; AVDYUNIN, N.I.;
KRASITSKAYA, A.I.; DEMICHEVA, M.A.;

Quality of students' knowledge in chemistry. Khim. v shkole 17 no.2:
91-94 Mr-Apr '62. (MIRA 15:3)

(Chemistry--Study and teaching)

VASIK, G.Ye.; KIRYUSHKIN, D.M.; LAVRENT'YEVA, A.V.; SYROYEZHNIKIN, I.T.

Organizing the independent work of students during the study
of the general properties of elements. Khim. v shkole 18
no.4:43-48 J1-Ag '63. (MIRA 17:1)

LAVRENT'YEVA, A.V., uchitel'nitsa

Organizing student experiments in chemistry lessons. Khim. v
shkole 17 no.5:53-57 S-O '62. (MIRA 15:9)

1. Srednyaya shkola No.433, Moskva.
(Chemistry--Experiments)

LAVRENT'YEVA, G. A.

"Terminology of the Theory of Mechanisms
(Structure and Classification of Mechanisms)."

Thesis for degree of Cand. Technical Sci.

Sub. 27 Oct. 50, Inst of Machine Studies, Acad Sci USSR

Summary 71, 4 Sep 52, Dissertations Presented for Degrees
in Science and Engineering in Moscow in 1950. From Vechernyaya
Moskva. Jan-Dec. 1950

-Laurent'eva, G.A.

SOURCE: Documentary: Newsletter, Issue No. 2, issued by the Center for Documentation and Communication Research, School of Library Science, Western Reserve University, Cleveland 6, Ohio.

1. To date, 10 papers, from 10 countries, have been scheduled for the subject Conference. They include:

- USSR
- AKHAROVA, O.S., Linguistics Institute, USSR Academy of Sciences, Moscow - "Common machine languages as 'auxiliary codes' for 'mediator languages'."
 - ANDREYEV, N.D., Experimental Laboratory of Machine Translation, Leningrad University - (1) "Report on the activities of the experimental laboratory of machine translation (Leningrad University)"; (2) "Universal code of science and machine languages."
 - CHERNILIN, V. P., LAVRENKO, G. A., and ZHURKOVA, N. Y., Institute of Scientific Information, USSR Academy of Sciences, Moscow - "Experimental information language for mechanization of searching of scientific and technical literature."
 - ZHURKOVA, N. Y., and TROTSKY, A. P., Moscow State University - "Chemical nomenclature translation."

Report to be submitted for the Intl. Conference on Machine Searching and Translation, (for Standards on a Common Language), Cleveland, Ohio, 6-12 September 1979.

37024

S/044/62/000/003/092/092

C111/C333

6,9500

AUTHORS:

Cherenin, V.P., Lavrent'yeva, G.A.
Zhidkova, N.V.

TITLE:

Experimental information language for the mechanized
search of the scientific-technical literature

PERIODICAL:

Referativnyy zhurnal., Matematika, no. 3, 1962, 79,
abstract 3 V 494. ("Vychisl. matematika", sb. 6, 1960,
118 - 160)

TEXT:

It is pointed to the boundedness of the traditional methods
for searching the scientific-technical literature, and the peculiarities
of the new searching methods are analyzed which are constructed without
considering the synthetic relations between the characteristics of the
object columns (methods of Ranganatan, Moors, Taub) as well as with
consideration of the complicated and essential synthetic relations
(methods of Perry, Andrew and Newman, Ferradeyn). The foundation of
most of these methods is the idea not to operate with the object
columns, but with their representations by sets of more general sense
units - characteristics synthetically connected with each other.

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Experimental information language ... S/044/62/000/003/092/092
C111/C333

experimental informative searching machine are described; the basis of these demands is the guarantee of a suitable comparison of the questions and columns and a sufficient flexibility for the transition from one experimental code to another under a maximally simple construction.

The authors describe the structure and functions of the experimental information machine constructed in 1954 and completed later on by an annex which renders possible the comparison of the codes under consideration of the essential synthetic relations (of the type of single grouping). The method for the coding of the object columns and of the characteristics of the question is described. The machine is tentatively used since 1958 for the experimental search of literature on the domain of mechanics. The results of the first experiments are most promising; a complete estimation of the elaborated searching system; however, will require much experimental work, where by the processes in single stages must be improved, the uniqueness and the automatization of the second indexing must be increased, the strategy of searching must be developed, the structure of the representations of the objects and of the terms must be varied.

[Abstracter's note : Complete translation.]
Card 3/3

KVASNIKOV, Ye.I.; LAVRENT'YEVA, G.I.; SLYUSARENKO, T.P.

New antibiotics, active against lactic acid bacteria, causative agents of infections in distilling industries. Prikl. biokhim. i mikrobiol. 1 no.4:414-419 JI-48 '65.

(MIRA 18:11)

1. Institut mikrobiologii i virusologii AN UkrSSR i Kiyevskiy tekhnologicheskii institut.

PETROVA, A., strakhovoy delegat; LAVRENT'YEVA, K., strakhovoy delegat

They could do more. Okhr.truda i spts.strakh. 5 no.12:16 D '62.
(MIRA 16:2)

(Kostroma--Plywood industry--Hygienic aspects)

LAVRENT'YEVA, L. D.
Acad Sci Kazakh SSR. Inst of Power

LAVRENT'YEVA, L. D.- "The qualitative characteristics of the hydraulic power resources of mountain rivers." Acad Sci Kazakh SSR. Inst of Power. Alma-Ata, 1956.
(Dissertation for the Degree of Candidate in Technical Sciences.)

SO: Knizhnaya Letopis' No. 13, 1956.

LAVRENT'YEVA, L.D.
KALACHEV, N.S.; LAVRENT'YEVA, L.D.

Hypsometric index for the qualitative evaluation of water-power
resources. Izv. AN Kazakh SSR, Ser. energ. no. 11:62-69 '56.
(Hydrology) (MLRA 10:2)

KALACHEV, Nikolay Stepanovich; LAVRENT'YEVA, Lyudmila
Dmitriyevna; CHOKIN, Sh.Ch., akademik, red.; POGOZHEV,
A.S., red.; GLAZYRINA, D.M., red.

[Cadastral survey of water-power resources of the rivers
of the Kazakh S.S.R.; potential resources] Vodnoenerge-
ticheskii kadastr rek Kazakhskoi SSR; potentsial'nye re-
sursy. Alma-Ata, Nauka, 1965. 706 p. (MIRA 18:7)

1. Akademiya nauk Kazakhskoy SSR (for Chokin).

LAVRENT'YEV, P.F.; LAVRENT'YEVA, L.D.

Effect of the rate of stream flow on annual distribution of
runoff. Trudy KazNIGMI no.12:64-72 '59.

(MIRA 13:5)

(Dzungarian Ala-Tau--Runoff)

LAVRENT'YEVA, I.D.

Approximate evaluation of the average flow from the watershed of
the southwestern slope of the Tarbagatay Range. Izv. AN Kazakh.
SSR. Ser. energ. no.2:106-111 '61. (MIRA 14:12)
(Tarbagatay Range--Water supply)

KALACHEV, N.S., kand.tekhn.nauk; LAVRENT'YEVA, L.D., kand.tekhn.nauk

New data on hydroelectric power resources in Kazakhstan. Vest.
AN Kazakh.SSR 18 no.11:19-28 N '62. (MIRA 15:12)
(Kazakhstan--Hydroelectric power)

LAVRENT'YEV, P.F.; LAVRENT'YEVA, L.A.

Water and water-power resources of the rivers in South Kazakhstan.
Trudy Otd. geog. AN Kazakh. SSR no.11:115-134 '65.

(MIRA 18:8)

DAMIR, Ye.A.; LAVRENT'YEVA, L.F.

Experimental use of vitamin B₁₅ for the "protection of the liver"
in anesthesia and toxic effects. Eksper. khir. i anest. 9
no.5:67-70 S-O '64. (MIRA 18:11)

1. Kafedra anestezilogii (zav. - dotsent Ye.A.Damir) Tsentral'-
nogo instituta usovershenstvovaniya vrachey, Moskva.

15(2)

SOV/112-59-2-2332

Translation from: Referativnyy zhurnal. Elektrotehnika, 1959, Nr 2, p 7 (USSR)

AUTHOR: Presnov, V. A., and Lavrent'yeva, L. G.

TITLE: Investigation of Vacuumtight Ceramics
(Issledovaniya vakuumnopltnoy keramiki)

PERIODICAL: Tr. 1-y Mezhvuzovsk. konferentsii po sovrem. tekhn. dielektrikov
i poluprovodnikov. 1956, L., 1957, pp 76-84

ABSTRACT: The VK-92 vacuumtight ceramic mass (containing 90% talcum plus kaolin and boracite) contains a considerable amount of free silica SiO_2 in the form of cristobalite; because of a cristobalite modification change, the mass has a maximum of temperature expansion factor at 220°C . Addition of MgO binds SiO_2 and facilitates the formation of clinoenstatite Mg_2SiO_3 after firing. With the addition of 6% of MgO at $1,400^\circ\text{C}$, the crystalline phase consists almost entirely of clinoenstatite. X-ray analysis data shows that at $950-1,000^\circ\text{C}$ MgO reacts with SiO_2 (a product of talcum disintegration) and

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Investigation of Vacuumtight Ceramics

SOV/112-59-2-2332

forms Mg silicates. The free SiO_2 content in the VK-92 can also be reduced by introducing alkali-earth and alkali-metal oxides. T_g of the VK-92 mass decreases upon introduction of MgO . A plot of conductance against temperature testifies to the fact that the nature of current carriers does not change in this case. Addition of alkali-metal and alkali-earth metal oxides reduces the maximum temperature coefficients of mass expansion and strengthens it mechanically. An ultraporcelain-53 to which 3% of ZrO_2 or SiO_2 was added to improve its cohesion with metals was also investigated. This changed its electrical and mechanical properties slightly. A juxtaposition of the properties of ceramic materials with the characteristics of their fundamental crystalline phases shows that material properties are primarily determined in their amorphous phase. Bibliography: 17 items. Sibirskiy fiziko-tekhnicheskii institut (Siberian Physics-and-Engineering Institute).

F.B.G.

Card 2/2

AUTHORS: Lavrent'yeva, L. G. and Presnov, V. A. SOV/139-58-4-22/30

TITLE: On the Polymorphism of Steatite Ceramics
(O polimorfizme steatitovoy keramiki)
I. X-ray Investigation of the Structure of Steatite
(I. Rentgenograficheskiye issledovaniya struktury steatita)

PERIODICAL: Izvestiya Vysshikh Uchebnykh Zavedeniy, Fizika,
1958, Nr 4, pp 135-139 (USSR)

ABSTRACT: Paper presented at the Inter-University Conference on Dielectrics and Semiconductors, Tomsk, February, 1958. In the past much attention has been paid to the physical and technological properties of the manufacture of steatite but too little attention has been given to the microscopic processes, i.e. to structural changes, in spite of the fact that these changes govern the observed changes in properties. The main aim of the here described work was to study the structure and structural changes of vacuum-tight ceramics. The process of forming was studied of the crystalline component of various steatite materials which were produced by pressing and also by casting under pressure in the hot state. First, the structural studies are described of specimens produced by

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On the Polymorphism of Steatite Ceramics

SOV/139-58-4-22/30

pressing. In studying the ceramic material VK-92 (B) the lines enumerated in Table 1, p 156, were selected as being the most characteristic for each phase under consideration. The changes of the phase composition of this ceramic is graphed in Fig.1a; it can be seen that up to 850°C talc predominates, then, due to decomposition of the talc, an intermediate product, hydroenstatite, forms which becomes transformed at more elevated temperatures into protoenstatite; the silica which separates out during the decomposition manifests itself in the X-ray patterns as cristobalite from 1100°C onwards. Specimens fired above 1250 to 1320°C show a partial transformation of protoenstatite into clinoenstatite but even specimens fired at 1400°C contain magnesium metasilicate, predominantly in the form of protoenstatite. Magnesium oxide additions between 1 and 6% were tried and also barium oxide additions as well as additions of oxides of alkali metals (1% Na₂O or K₂O). In Table 2 an enumeration is given of the bending strength of specimens from three types of materials produced by casting under pressure and, for

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On the Polymorphism of Steatite Ceramics

SOV/139-58-4-22/30

comparison, the data for the same materials are given if produced by pressing. Some of the results obtained on specimens produced by casting under pressure in the hot state are graphed in Fig.3 and it can be seen that generally the dependence of the phase composition on the temperature is comparable for all the tested ceramic materials. The determined higher mechanical strength of ceramic materials produced by casting under pressure is attributed to the absence of polymorphous transformations of magnesium metasilicate, due to the stabilisation of protoenstatite and also to the saturation of the glass phase and possibly also of the crystal phase with silica which results in an improvement in the physico-chemical and mechanical properties of the glass phase, which in turn brings about a stabilisation of the protoenstatite. The results are summarised thus:

1) It was found that additions of magnesium oxide bring about a transformation of the protoenstatite into clinoenstatite, whilst BaO, Na₂O and K₂O brake such transformation. This is probably due to the change in

Card3/4 the composition of the glass phase resulting from the

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simultaneous transformation of the silica into the glass phase.

2) During firing of cast specimens, a transformation of clinoenstatite into protoenstatite was observed (1100-1150°C). The formed protoenstatite has a higher stability to polymorphism and this can be due to either a partial dissolution of the cristobalite into the glass phase, which brings about an increase in viscosity, or formation of a solid solution of silica in the protoenstatite which slows down the process of polymorphous transformation. There are 3 figures, 2 tables and 7 references, 6 of which are Soviet, 1 English.

ASSOCIATION: Sibirskiy fiziko-tekhnicheskiy institut pri Tomskom gosuniversitete imeni V. V. Kuybysheva
(Siberian Physico-Technical Institute at the Tomsk State University imeni V. V. Kuybyshev)

SUBMITTED: March 19, 1958

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SOV/139-58-5-9/35

AUTHORS: Lavrent'yeva, L. G. and Presnov, V. A.

TITLE: Polymorphism of Steatite Ceramics. II. The Effect of Heat Treatment of the Ceramic on the Composition of the Crystal Phase (O polimorfizme steatitovoy keramiki. II. Vliyaniye temperaturnoy obrabotki keramiki na sostav kristallicheskoy fazy)

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, fizika, 1958, Nr 5, pp 48-51 (USSR)

ABSTRACT: This paper was presented at the Conference of Higher Educational Establishments on Dielectrics and Semiconductors, Tomsk, February, 1958. The main crystal component of steatite ceramics is either magnesium metasilicate MgSiO_3 or orthosilicate Mg_2SiO_4 , the latter in materials with higher concentrations of magnesium oxide. Magnesium orthosilicate (forsterite) exhibits no polymorphic transitions. It is generally assumed (Refs.1, 2) that magnesium metasilicate exists in 2 modifications: α -clino-enstatite and β -enstatite; these 2 modifications are enantiotropic and the transition

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SOV/139-58-5-9/35

Polymorphism of Steatite Ceramics. II. The Effect of Heat Treatment of the Ceramic on the Composition of the Crystal Phase

temperature lies near 1190°C . A third modification, known as proto-enstatite, consists of clino-enstatite with a somewhat deformed crystal lattice. Some workers (Refs.3-6) regard proto-enstatite as a separate modification of magnesium metasilicate. A fourth modification, called $\delta\text{-MgSiO}_3$, has also been reported (Ref.7). The present paper deals with X-ray crystallographic studies of steatite samples which have undergone various thermal treatments. The authors investigated polymorphism and stability of modifications of MgSiO_3 . The authors used materials whose predominant crystal phase was in the form of proto-enstatite and subjected them to thermal treatment in order to study stability of clino-enstatite. Thermal treatment below 1000°C and of several hours' duration produced a small increase in the amount of clino-enstatite. Transformation into clino-enstatite occurs faster if the material is in powder form. Longer treatments produce complete transformation of proto-enstatite into clino-enstatite. Heating the ceramic for 25 hours at 1150°C transforms clino-enstatite into proto-enstatite (Table 1). Longer heating with LiF flux induces the reverse transformation with proto-enstatite chang-

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SOV/139-58-5-9/35

Polymorphism of Steatite Ceramics. II. The Effect of Heat Treatment of the Ceramic on the Composition of the Crystal Phase

ing into clino-enstatite on cooling to room temperature. The authors also studied the structure of samples subjected to multiple heating at temperatures close to the firing temperature. The relative changes in the amounts of proto-enstatite and clino-enstatite, deduced from the X-ray crystallographic data, are shown in Fig.1. Composition of 4 ceramics (VK-91, M-4, K-1, K-2) studied is given in Table 2; all 4 of them consist mainly of talc. The following conclusions are made from the results obtained. 1) Proto-enstatite is the stable modification of MgSiO_3 at high temperatures. 2) A polymorphic

transition of proto-enstatite into clino-enstatite, accompanied by a change in volume, is possible on cooling of a sample, on heat treatment below 1000°C and in storage. 3) The change in volume occurring in the polymorphic transition referred to above may be the reason for the poorer mechanical strength and the loss of impermeability to gases useful in vacuum work. 4) The rate of polymorphic transformations depends on the composition of the glassy phase of the ceramic and on the dimensions of crystallites; the rate increases with decrease of viscosity of the glassy phase and with increase of dimensions of proto-

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Polymorphism of Steatite Ceramics. II. The Effect of Heat Treatment of the Ceramic on the Composition of the Crystal Phase

enstatite crystallites. 5) The mechanical strength of steatite ceramic materials increases with decrease of the free silicon content in the form of cristobalite, as shown in Fig.2 (data on mechanical strength were obtained from the laboratory directed by Kh. B. Kogan). The work reported in the present paper is part of a wider programme at the Siberian Physico-Technical Institute, carried out in conjunction with engineers. There are 2 figures, 2 tables and 9 references, 5 of which are Soviet and 4 German.

ASSOCIATION: Sibirskiy fiziko-tekhnicheskii institut pri Tomskom gosuniversitete imeni V. V. Kuybysheva (Siberian Physico-Technical Institute at Tomsk State University im.V.V.Kuybyshev)

SUBMITTED: March 19, 1958.

Card 4/4

5/112/60/000/05/13/023

Translation from: Referativnyy zhurnal. Elektrotehnika, 1960, No. 5, p. 357,
5.2037

AUTHOR: Lavrent'yeva, L. G.

TITLE: Investigating Composition and Structure of Vacuum-Tight Ceramics and
Their Properties

PERIODICAL: Uch. Zap. Tomskiy un-t, 1958, No. 32, pp. 18-28

TEXT: Investigations were carried out to establish the dependence of the properties of BK-92 (VK-92) grade vacuum-tight ceramics, used as shells of metal-ceramic radio tubes, on the quantity of several additives added to the talc constituting 90% of the mass. The author gives tables of the electric and mechanical properties of ceramics with different MgO , BaO and Na_2O content and describes the formation processes of the crystalline phase of VK-92 ceramics during baking at temperatures ranging from 20 to 1,400°C. The addition of MgO to the mass results in the formation of clinenstatite as the basic crystalline phase. The addition of other alkali or alkali-earth oxides does not alter the basic crystalline phase of ceramics. The addition of barium and magnesium oxides

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Investigating Composition and Structure of Vacuum-Tight Ceramics and Their Properties

results in a leveling of the maximum of the curve showing the mean coefficient of thermal expansion as a function of temperature, which improves the heat resistance of ceramics. Insignificant additions of alkali metal oxides deteriorate the electric and mechanical properties of ceramics considerably. ✓ B

S. E. K.

Card 2/2

SOV/81-59-9-32101

Translation from: Referativnyy zhurnal. Khimiya, 1959, Nr 9, p 360 (USSR)

AUTHOR: Lavrent'yeva, L.G.

TITLE: The Effect of the Composition and the Structure of Vacuum-Dense Ceramics on Its Properties

PERIODICAL: Uch. zap. Tomskiy un-t, 1958, Nr 32, pp 18 - 28

ABSTRACT: The structure of vacuum-dense VK-92 ceramics and the effect of the change in structure on its mechanical and electrical properties have been studied. It has been established that the principal crystalline phase of VK-92 ceramics is mesoenstatite. An addition (1 - 6 weight %) of MgO leads to the formation of clinoenstatite as principal crystalline phase. The introduction of other oxides (in weight %): BaO 1-4, Na₂O 1, K₂O 1, does not change its principal crystalline phase. All the oxides introduced decrease the quantity of free cristobalite and thereby improve the heat-resistance of ceramics. A diagram of the processes of formation of the crystalline phase in steatite ceramic materials is given. The electrical and mechanical properties of the ceramic materials studied are determined mainly by the glass-like phase. G. Gerashchenko

Card 1/1

15.2130

Translation from: Referativnyy zhurnal. Khimiya, 1959, Nr. 12, p 310 (USSR) 01772
SOV/81-59-12-43045

AUTHOR: Lavrent'yeva, L.G.

TITLE: The Effect of Additions of Magnesium Oxide on the Formation Process of the Crystal Phase of VK-92 Ceramics

PERIODICAL: Tr. Sibirsk. fiz.-tekhn. in-ta pri Tomskom un-te, 1958, Nr. 36, pp 193-201

ABSTRACT: The effect of magnesium oxide additions on the formation of the crystal phase of the ceramic mass VK-92, containing $>90\%$ talc, a small quantity of kaolin and boracite, has been studied by roentgen-structure analysis. It has been established that the formation of the ceramic body of the masses VK-92, M-VI (with the addition of 6% MgO) and M-III (with the addition of 3% MgO) starts with the decomposition of the talc structure at $850 - 900^{\circ}\text{C}$ following by the formation of hydroenstatite. At $1,150 - 1,200^{\circ}\text{C}$ hydroenstatite is converted to mesoenstatite. At an increase in the temperature (to $1,400^{\circ}\text{C}$) the structural changes depend on the quantity of magnesium oxide introduced into the ceramics. In the

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67992

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The Effect of Additions of Magnesium Oxide on the Formation Process of the
Crystal Phase of VK-92 Ceramics

mass M-VI a complete transition from the mesoenstatite structure to the clinostatite structure is noted. The latter is the basic crystal phase of this ceramics. In the mass M-III a partial transition of mesoenstatite to clinostatite is noted. After burning at $1,400^{\circ}\text{C}$ in M-III ceramics exist two basic crystal phases, mesoenstatite and clinostatite, approximately in equal quantities. In the ceramic mass VK-92 the transition of mesoenstatite to clinostatite practically does not take place. The basic crystal phase of VK-92 ceramics is mesoenstatite. It is noted that the introduction of 6% MgO into the ceramic mass VK-92 accelerates the process of formation of the crystal phase approximately by 100°C and causes the formation of the crystalline phase in the form of clinostatite.

G. Maslennikova

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67993

SOV/81-59-12-43064

15.2130

Translation from: Referativnyy zhurnal. Khimiya, 1959, Nr 12, p 312 (USSR)

AUTHOR: Lavrent'yeva, L.G.

TITLE: The Process of Formation of the Crystal Phase of Forsterite Ceramics

PERIODICAL: Tr. Sibirsk. fiz.-tekhn. in-ta, 1958, Nr 36, pp 203-204

ABSTRACT: The formation of the crystal phase of forsterite ceramics has been studied by roentgen-structural analysis. The forsterite mass was prepared on the base of talc and MgO (25%) with inconsiderable additions of kaolin and boracite. It has been established that the crystal phase of the investigated ceramics consists mainly of forsterite. The transition from the structure of talc and MgO to the forsterite structure takes place with the formation of an intermediate crystal phase, hydroenstatite. The formation of forsterite is completed at 1,200 - 1,250°C, then recrystallization takes place, which leads to the growth of crystals.

G. Maslennikova

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LAVRENT'YEVA, L. G., Cand Phys-Math Sci -- (diss) "Research into the structure of steatite ceramic radio-materials." Tomsk, 1960. 44 pp; Tomsk State Univ im V. V. Kuybyshev); 150 copies; price not given; (KL, 24-60, 128)

Films of gallium arsenide and their properties. V. A. Presnov,
L. G. Lavrent'yeva, M. D. Vilisova, I. K. Kovalev.

On the physico-chemical nature of the formation of contacts of gallium
arsenide with metals. V. A. Presnov, A. N. Vyatkin.
(Presented by A. N. Vyatkin--10 minutes).

Report presented at the 3rd National Conference on Semiconductor Compounds,
Kishinev, 16-21 Sept 1963

LAVRENT'YEVA, L.G.; VYATKIN, A.P.; PRESNOV, V.A.

Tunnel effect in films of degenerate gallium arsenide. Izv. vys.
ucheb. zav.; fiz. no.5:174-176 '63. (MIRA 16:12)

1. Sibirskiy fiziko-tekhnicheskoy institut pri Tomskom gosudarst-
vennom universitete imeni V.V.Kuybysheva.

L 32620-66 EWT(m)/I/EWP(t)/ETI IJP(c) JD
ACC NR: AR6000072 SOURCE CODE: UR/0275/65/000/009/B011/B011

AUTHOR: Lavrent'yeva, L. G.; Kovalev, I. K. 28
B

TITLE: Preparation of single-crystal germanium film by sputtering in vacuum

SOURCE: Ref. zh. Elektronika i yeye primeneniye, Abs. 9B89

REF SOURCE: Dokl. Nauchno-tekhn. konferentsii, posvyashch. dnyu radio. Tomsk, Tomskiy un-t, 1964, 3-6

TOPIC TAGS: single crystal, semiconductor single crystal, germanium single crystal

ABSTRACT: Epitaxial films of Ge were obtained at substrate temperatures of the order of 450—500°C. Ge of p-type was sputtered from a tungsten spiral onto an n-type Ge substrate. The source temperature was 1100 to 1300°C. The base temperature was maintained by an external heater within a range of 450 to 650°C. The pressure in the system was 10^{-5} mm Hg. The optimum sputtering rate was found to be 1 μ /min. At high sputtering rates a film with a fine-grained deposit on the surface was obtained. The film thickness was 3 to 15 μ . Sputtering of a p-type film on an n-type Ge substrate resulted in the formation of p-n junctions. The contact was fused into the film with pieces of Sn in air at a temperature close to the melting point of Sn. Films not protected by Sn were etched away with perhydrol.

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The volt-ampere characteristics of the obtained p-n junctions indicated a rectification coefficient of 2600, a forward current of 520 μ amp, and a back current of 200 μ amp. The relatively high back currents were apparently caused by the higher concentration defects in the film. Refs.: 3. N.Sh.

SUB CODE: 20/ SUBM DATE: none

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2/2 20

L 3368-66 EWT(1)/T IJP(c) GG/GS

UR/0000/64/000/000/0422/0431

ACCESSION NR: AT5020489

AUTHORS: Vilisova, M. D.; Lavrent'yeva, L. G.; Murashko, V. S.; Presnov, V. A.
(Professor) 44,55 44,55 44,55 44,55

TITLE: Producing and studying gallium arsenide films

58
B+1

SOURCE: Mezhevuzovskaya nauchno-tekhnicheskaya konferentsiya po fizike
poluprovodnikov (poverkhnostnyye i kontaktnyye yavleniya. Tomsk, 1962.

Poverkhnostnyye i kontaktnyye yavleniya v poluprovodnikakh (Surface and contact
phenomena in semiconductors). Tomsk, Izd-vo Tomskogo univ., 1964, 422-431

TOPIC TAGS: gallium arsenide, iodine, cadmium sulfide, selenium, microelectronic
thin film 44,55

ABSTRACT: Methods of producing gallium arsenide films, their electrical
conductivity, grain size, charge-carrier concentration, and thermo-emf coefficient,
and the results of tests of the films for uniformity of thickness and resistance
are discussed. The work was done to develop methods of producing thin homogeneous
gallium arsenide films of stoichiometric composition, and the tests were performed
to evaluate the various methods. Gallium arsenide films were prepared by
vaporization in a vacuum (vaporization temperature, ~ 1000C, substrate temperature,
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ACCESSION NR: AT5020489

400-450C, layer thickness, $\sim 3-4\mu$; by thermal sublimation (source temperature, 1000-1100C, substrate temperature, 700-800C, growth rate, $0.5-3\mu/hr$); and by the iodide method, where an evacuated quartz ampule containing GaAs, iodine, and a substrate is heated in a furnace (source temperature, 100-200C higher than substrate temperature; substrate temperature $> 600C$; growth rate, $50-100\mu/hr$). The average size of the crystals in the films produced by distillation and the iodide method was $4-5\mu$. Typical curves of the conductivity σ , Hall coefficient R_H , and thermo-emf coefficient α versus temperature for certain polycrystalline films are given in Fig. 1 on the Enclosure. It is shown that the sublimation and iodide methods produce polycrystalline and epitaxial GaAs films that are fairly uniform in thickness and resistance. Both methods also allow doping with Zn, Cd, and Se. Orig. art. has: 10 graphs, 1 diagram, 2 tables, and 1 formula.

ASSOCIATION: *[Faint text, possibly "None"]*

SUBMITTED: 06Oct64

ENCL: 01

SUB CODE: SS

NO REF SOV: 004

OTHER: 002

Cord 2/3

L 3368-66

ACCESSION NR: AT5020489

ENCLOSURE: 01

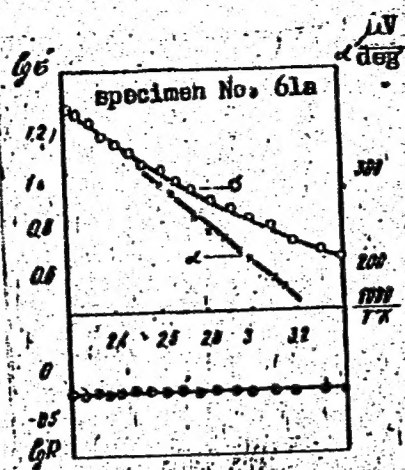


Fig. 1. Curves of conductivity, Hall coefficient, and thermo-emf coefficient versus temperature for polycrystalline specimen

Cord 3/3

L 15942-66 EWT(m)/EWP(t)/EWP(b) IJP(c) JD/JG

ACC NR: AT6002269

(A)

SOURCE CODE: UR/2564/65/006/000/0340/0347

52
57

AUTHOR: Lavrent'yeva, L.G.; Vilisova, M.D.

B+1

ORG: none

TITLE: Preparation of epitaxial and macrocrystalline gallium arsenide layers by the sublimation method (Paper presented at the Third Conference on Crystal Growing held in Moscow from 18 to 25 November, 1963.)

SOURCE: AN SSSR. Institut kristallografi. Rost kristallov, v. 6, 1965, 340-347

TOPIC TAGS: epitaxial growing, gallium arsenide, germanium, tunnel diode

ABSTRACT: Sublimation in evacuated and sealed ampoules was used to obtain stoichiometric films of gallium arsenide with n- and p-type conductivity and various resistivities and carrier concentrations up to the degenerate value. It was shown that a temperature profile with a temperature minimum permits a satisfactory reproducibility of the properties of the films in a series of experiments. Polycrystalline gallium arsenide films with a grain size of 10 — 30 μ were successfully employed for the preparation of film tunnel diodes. It was noted that when the films were deposited on gallium arsenide substrates oriented in the (111) plane, epitaxial deposited occurred readily on the arsenic

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ACC NR: AT6002269

side of the plates (plane $\bar{1}\bar{1}\bar{1}$). As a rule, polycrystalline films were obtained on the gallium side. In the deposition of gallium arsenide on germanium oriented in the (111) plane, the direction of growth of the condensate was $[\bar{1}\bar{1}\bar{1}]$. Authors thank A.P. Izergin for providing gallium arsenide for the investigations. Orig. art. has: 11 figures and 1 table.

SUB CODE: 20 / SUBM DATE: none / ORIG REF: 003/ OTH REF: 002

FW
Card 2/2